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Suzuki et al.

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(54) **CONNECTOR CAPABLE OF RESTRICTING A RELATIVE ROTATIONAL MOVEMENT BETWEEN FEMALE AND MALE CONNECTORS**

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H01R 13/42 (2006.01)
H01R 13/631 (2006.01)

(52) **U.S. Cl.**
CPC ***H01R 13/42*** (2013.01); ***H01R 13/631*** (2013.01)

(58) **Field of Classification Search**
CPC H01R 13/631; H01R 13/629; H01R 13/64; H01R 13/6456
USPC 439/374, 680, 357
See application file for complete search history.

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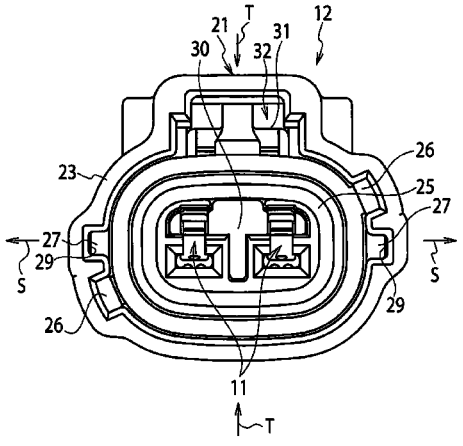
(57) **ABSTRACT**

A connector includes a female connector and a male connector fitted in a hood of the female connector. The female connector includes: paired guide grooves either provided at opposed positions on an inside wall of the hood; and regulation projections either provided on bottom surfaces of the paired guide grooves. The male connector includes paired guide ribs provided on an outer periphery of the male connector. The paired guide ribs either positioned in the paired guide grooves with the female connector and the male connector being fitted together regulate a relative rotational movement between the female and male connector. The regulation projections either in contact with the paired guide ribs regulate a relative vertical and transverse movement between the female and male connectors.

6 Claims, 9 Drawing Sheets



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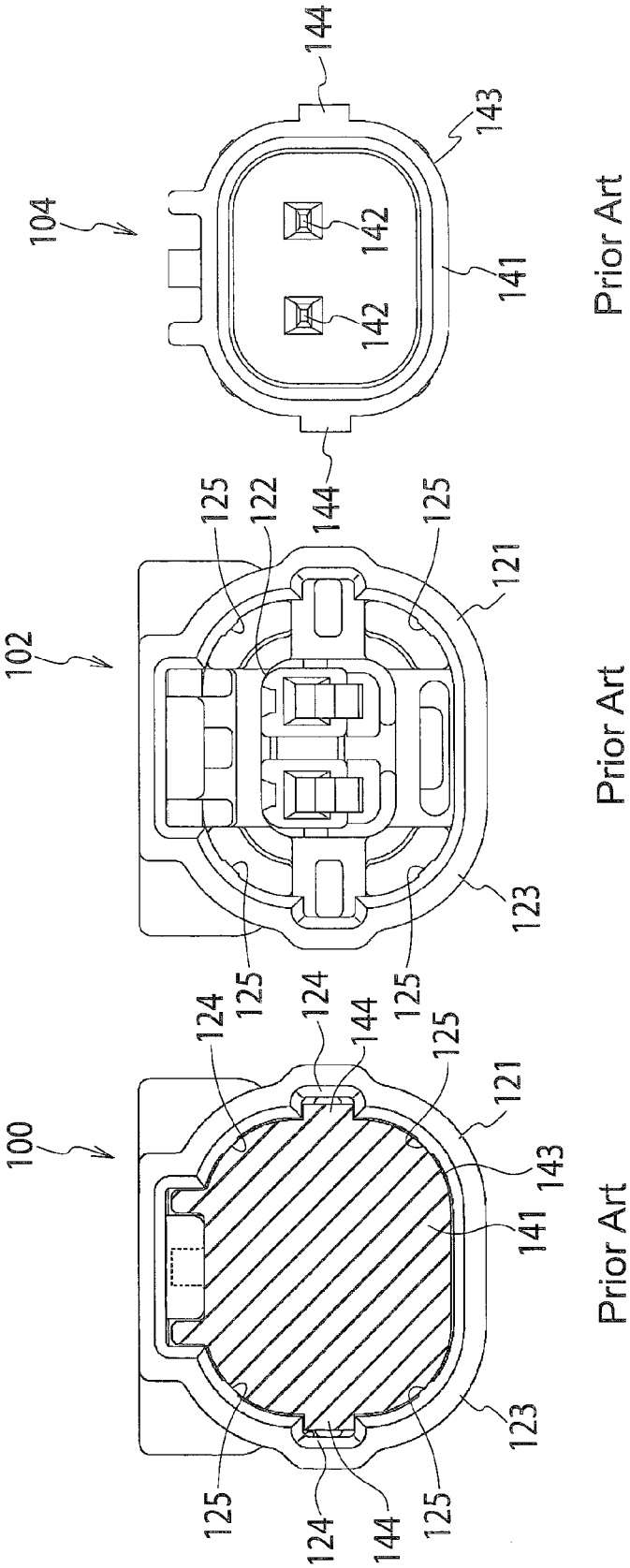
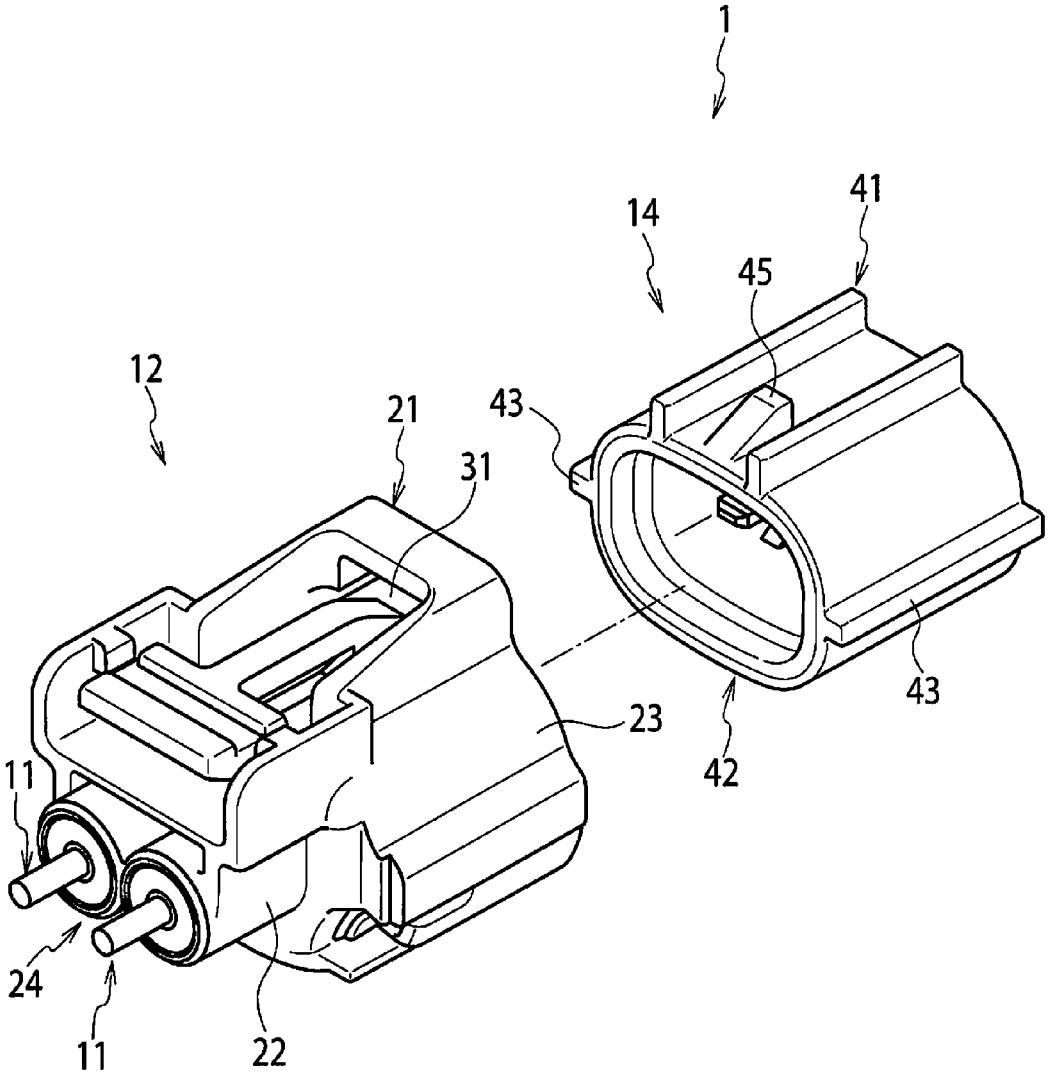


FIG. 1C Prior Art

FIG. 1B Prior Art

FIG. 1A Prior Art

FIG. 2



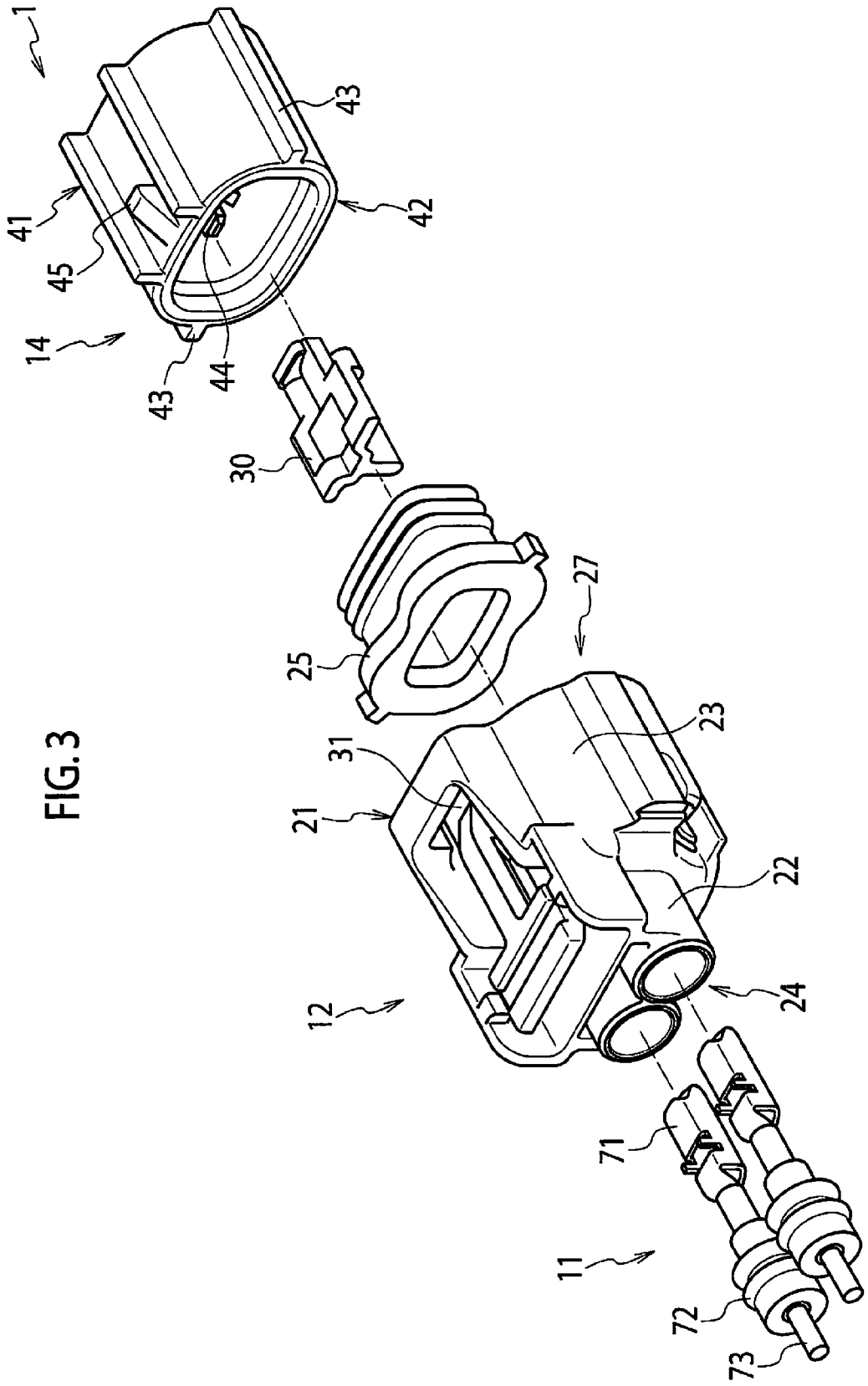


FIG. 3

FIG. 4B

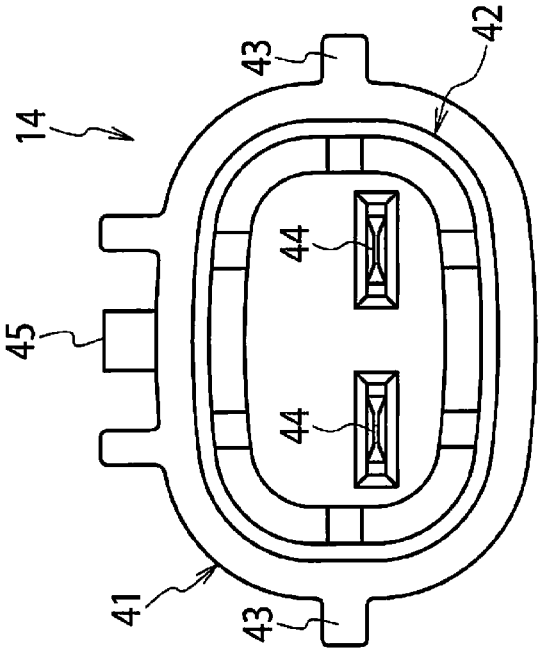


FIG. 4A

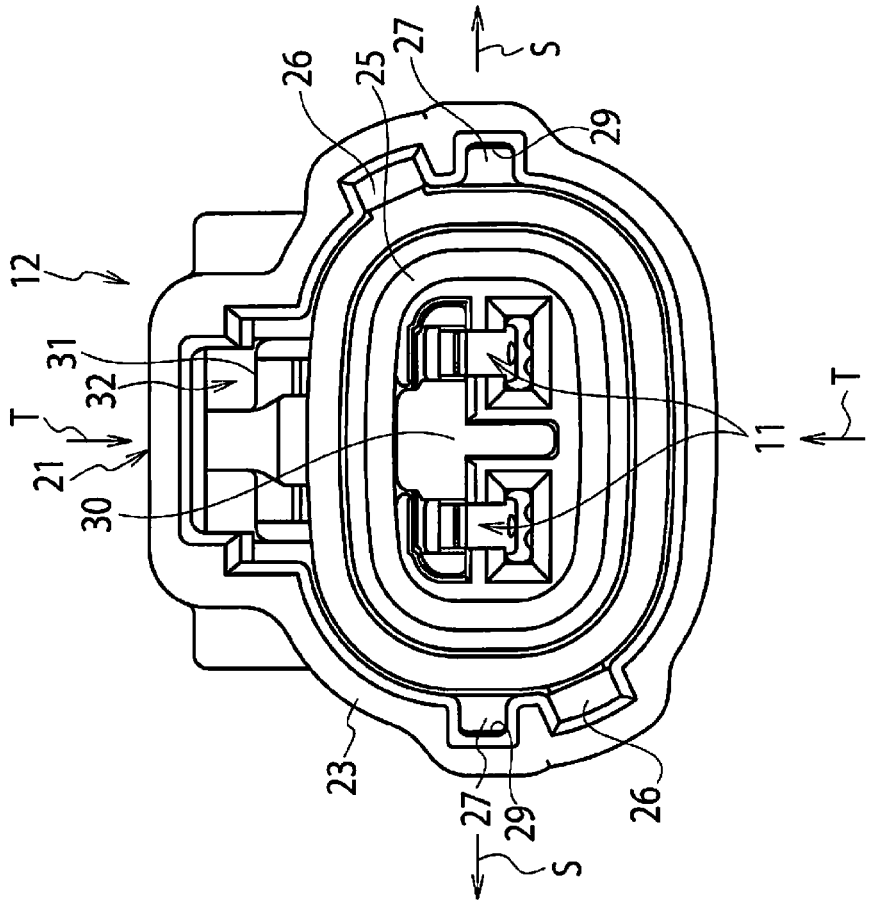


FIG. 5B

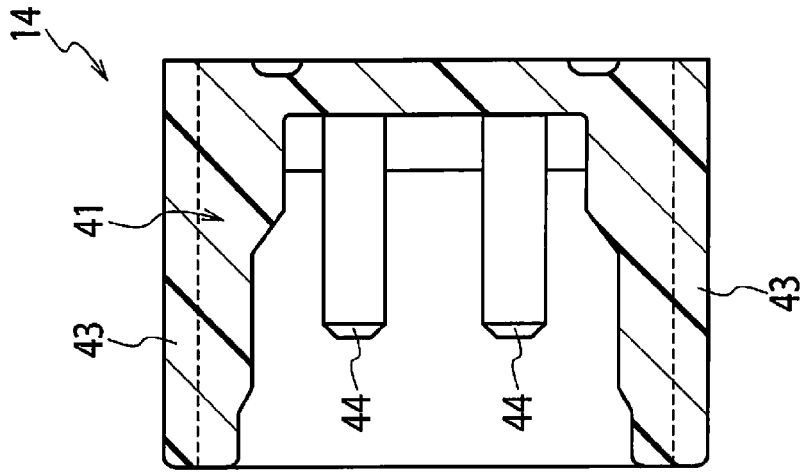
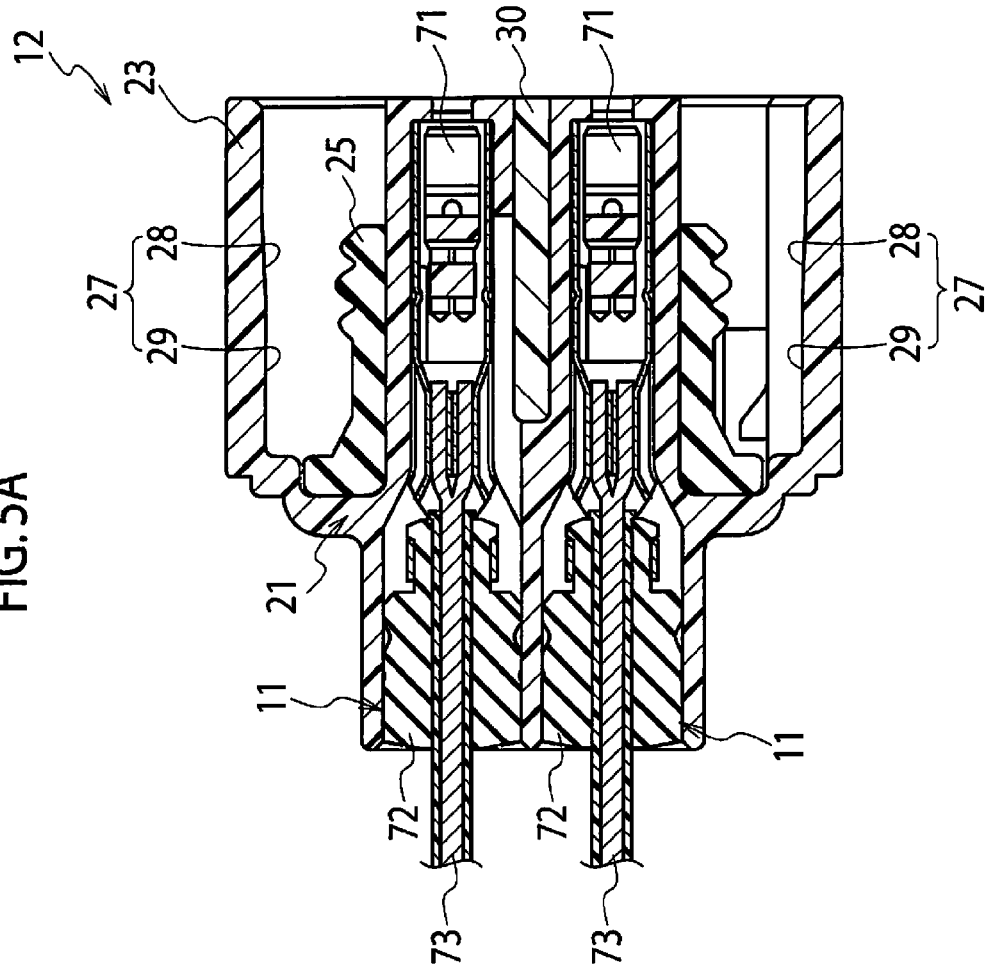

14
41
43
44
44
43

FIG. 5A


12
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71
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71
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73
73

FIG. 6

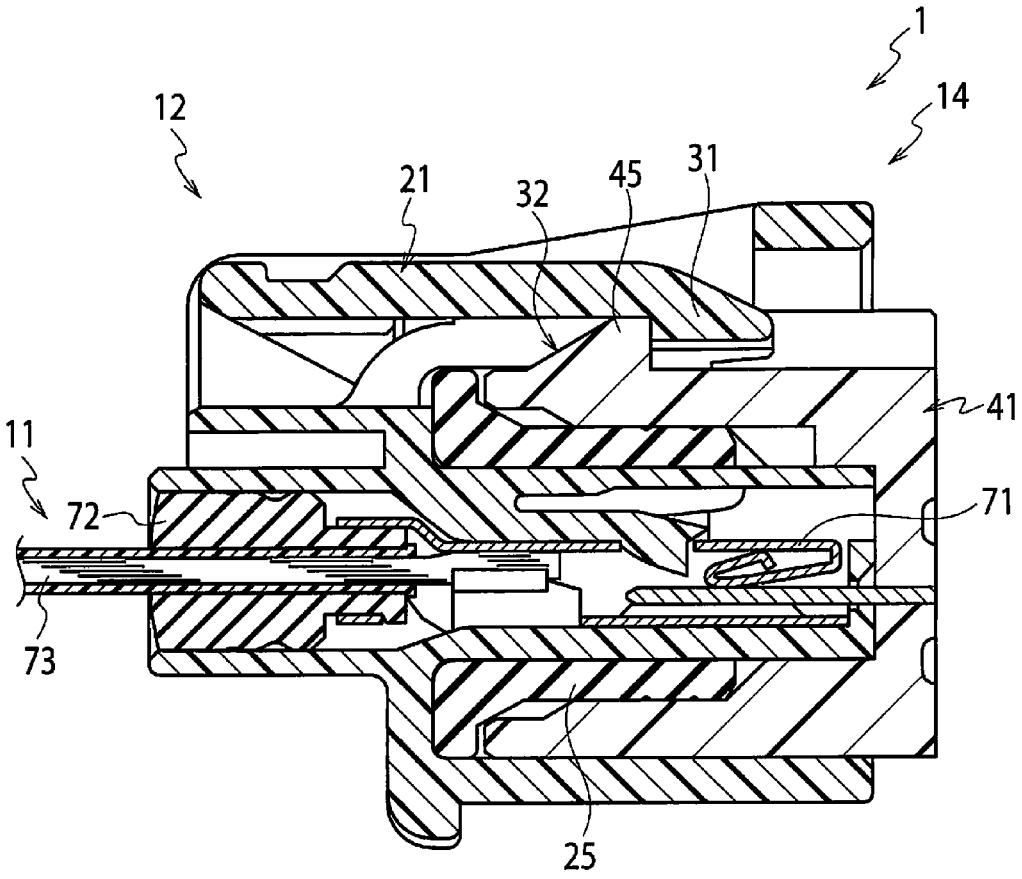
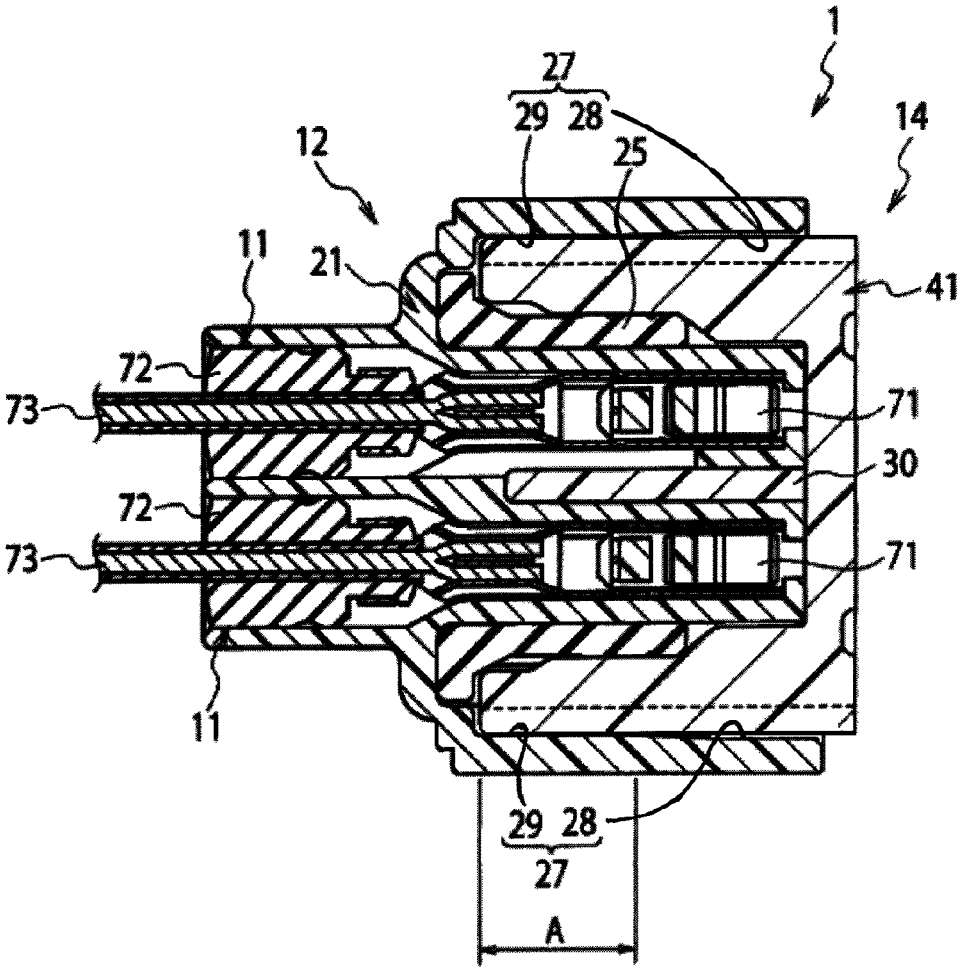


FIG. 7



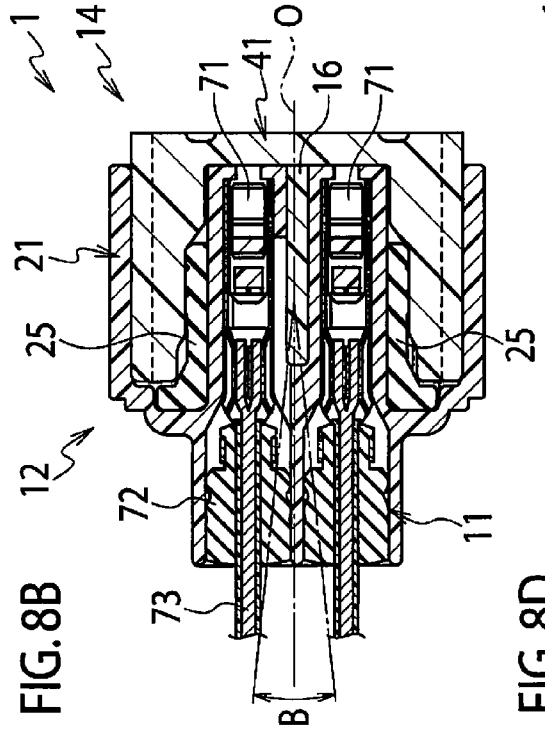


FIG. 8B

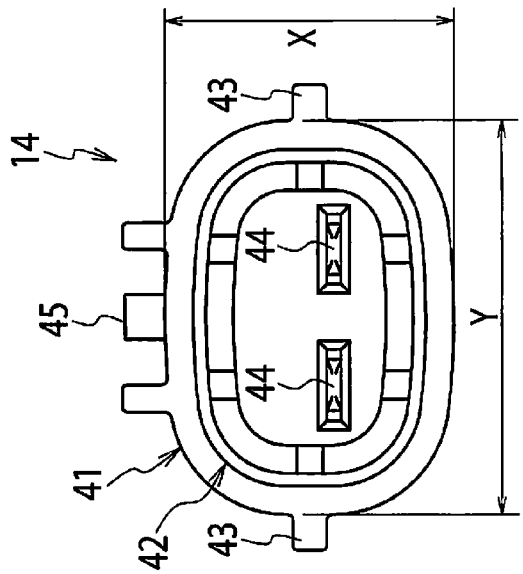


FIG. 8A

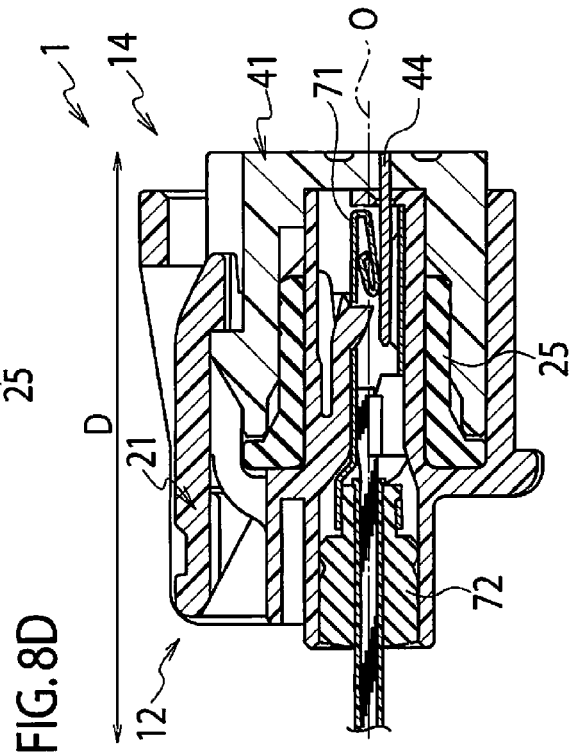


FIG. 8D

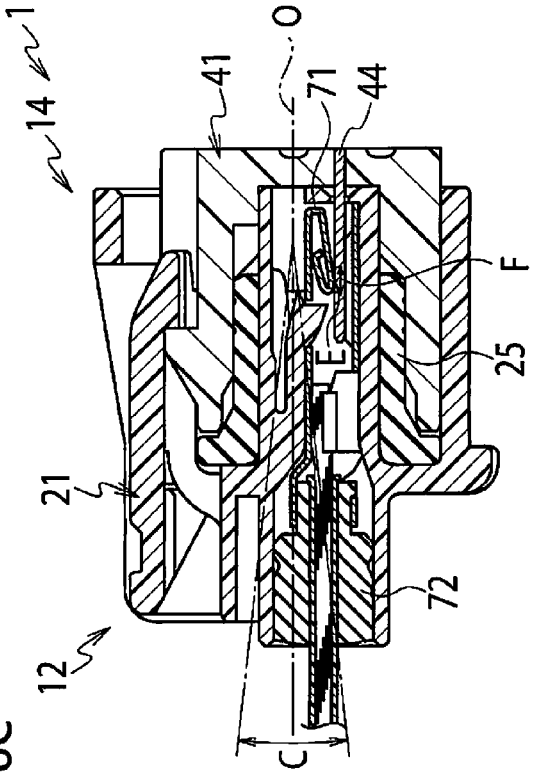


FIG. 8C

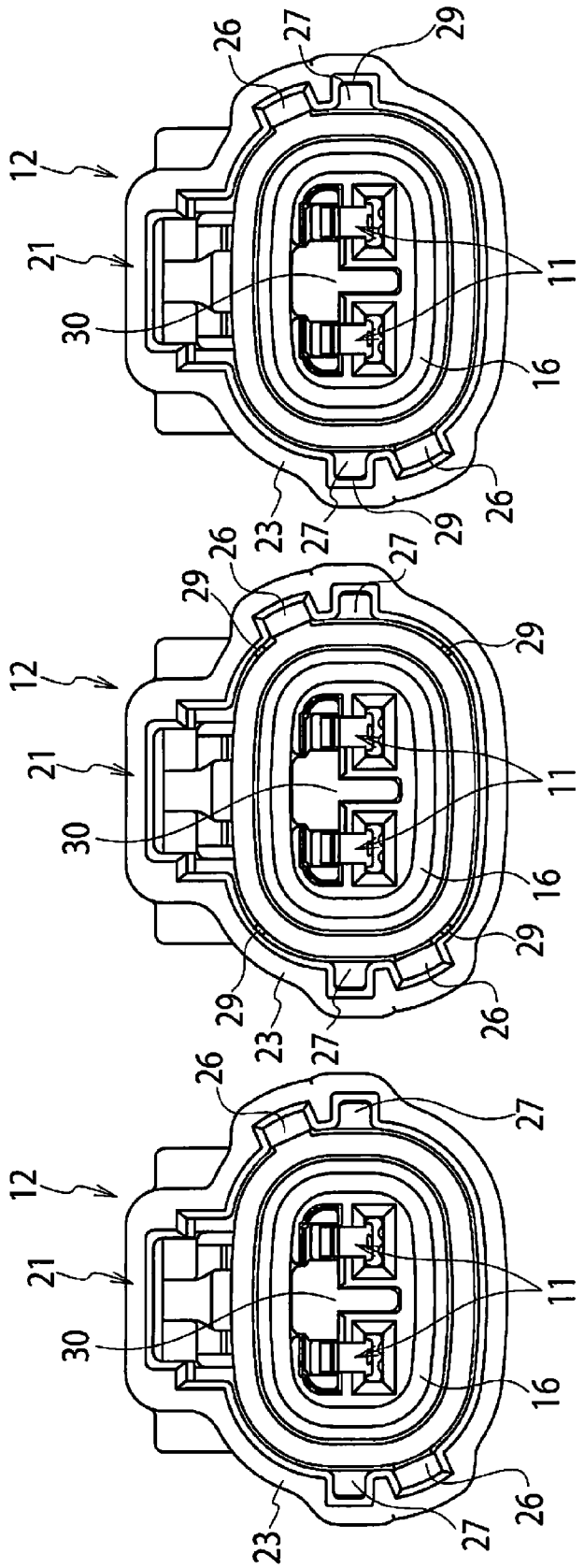


FIG. 9A

FIG. 9B

FIG. 9C

CONNECTOR CAPABLE OF RESTRICTING A RELATIVE ROTATIONAL MOVEMENT BETWEEN FEMALE AND MALE CONNECTORS

CROSS REFERENCE TO RELATED APPLICATION

This application is a Continuation of PCT Application No. PCT/JP2011/006872, filed on Dec. 8, 2011, and claims the priority of Japanese Patent Application No. 2010-287385, filed on Dec. 24, 2010, the content of both of which is incorporated herein by reference.

BACKGROUND

1. Technical Field

The present invention relates to a connector for connection of terminals of electric wire terminals.

2. Related Art

Patent Literature 1 describes a connector for electrical connection of female terminals and male terminals of electric wire terminals.

This kind of connectors have connector housings which accommodate a female connector and a male connector therein and are fitted together for a connection of female terminals and male terminals.

FIGS. **1**A to **1**C are views illustrating the connector described in Patent Literature 1. As illustrated in FIGS. **1**A to **1**C, a connector **100** includes a female connector **102** which accommodates female terminals therein and a male connector **104** which accommodates male terminals therein.

As illustrated in FIGS. **1**A and **1**B, the female connector **102** includes a cylindrically formed female connector housing **121**, a connector main body **123** which is provided with a terminal receiver **122** accommodating the female terminals therein, guide grooves **124** into which guide ribs **144** to be described below are insertable, and regulation projections **125** which are provided inside the female connector housing **121**.

As illustrated in FIGS. **1**A and **1**C, the male connector **104** includes a cylindrically formed male connector housing **141**, male terminal receivers **142** which accommodate the male terminals therein, a fitting hood **143** to be inserted inside the female connector **102**, and the guide ribs **144** which extend and project from the front to back along the entire length of the fitting hood **143**, and are insertable into the guide grooves **124**.

The guide ribs **144** are inserted into the guide grooves **124** to fit the female connector **102** with the male connector **104**. At this time, the regulation projections **125** provided in diagonal positions of the inside of the female connector housing **121** are in contact with the fitting hood **143**, holding a fitting state where the female connector **102** and the male connector **104** are fitted together.

CITATION LIST

Patent Literature

[PTL 1] Japanese Unexamined Patent Application Publication No. 2002-198127

SUMMARY

However, in the related connector **100** described above, the female connector housing **121** is elastically expanded and the regulation projections **125** are brought into contact with the fitting hood **143**, thereby restricting a relative rotational movement between the female connector **102** and the male connector **104**.

This causes a problem of an increase in a fitting force in portions where the regulation projections **125** are not in contact with the fitting hood **143** without a proper amount of clearance (clearance gap) between the fitting hood **143** and the regulation projections **125**.

An object of the present invention is to provide a connector capable of restricting a relative rotational movement between a female connector and a male connector and inhibiting an increase in a fitting force with which the female connector and the male connector are fitted together.

A connector in accordance with some embodiments includes a female connector configured to accommodate a female terminal of an electric wire terminal and have a hood and a male connector configured to accommodate a male terminal of an electric wire terminal and be fitted in the hood for connection of the female terminal and the male terminal. The female connector includes paired guide grooves either provided at opposed positions on an inside wall of the hood, and regulation projections either provided on bottom surfaces of the paired guide grooves. The male connector includes paired guide ribs provided on an outer periphery of the male connector. The paired guide ribs either positioned in the paired guide grooves with the female connector and the male connector being fitted together are configured to regulate a relative rotational movement between the female connector and the male connector. The regulation projections either in contact with the paired guide ribs are configured to regulate a relative vertical and transverse movement between the female connector and the male connector.

According to the configuration above, the guide ribs are inserted into the guide grooves. It is therefore possible to restrict a relative rotational movement between the female connector and the male connector.

The guide grooves have on the bottom surfaces the regulation projections either in contact with the guide ribs to regulate a relative vertical and transverse movement between the female connector and the male connector. It is therefore possible to inhibit an increase in a fitting force of the female connector and the male connector.

Therefore, it is possible to provide a connector capable of restricting a relative rotational movement between a female connector and a male connector and inhibiting an increase in a fitting force of the female connector and the male connector.

The female connector may include: a female connector housing; a connector main body having a terminal receiver; and an outer hood covering the connector main body. The paired guide grooves may be provided on an inside wall of the outer hood. The regulation projections may be either provided at rear positions of guide surfaces of the paired guide grooves.

According to the above-described configuration, the regulation projections are provided at the rear positions of the guide surfaces of the paired guide grooves provided on the inside wall of the outer hood. It is therefore possible to, when the female connector and the male connector are fitted together, restrict a relative rotational movement between the female connector and the male connector and to reduce a friction between the female terminal and the male tab caused by a rotational movement of the connector.

The female connector and the male connector have a proper amount of clearance (clearance gap) therebetween

when the female connector and the male connector are fitted together. It is therefore possible to inhibit an increase in a fitting force of the connector.

The male connector may include: a male connector housing; and a fitting hood inserted into between the connector main body and the outer hood when the female connector and the male connector are fitted together. The paired guide ribs may be either formed on side walls of the fitting hood located in a direction of a longer of a length of the fitting hood in a vertical direction or a length of the fitting hood in a transverse direction of the fitting hood.

According to the above-described configuration, the paired guide ribs are formed on the both side walls of the fitting hood. It is therefore possible to hold the female connector and the male connector in the regular fitting position. The guide ribs are also inserted into the guide grooves. It is therefore possible to increase a holding force.

The paired guide ribs are either formed on side walls of the fitting hood located in a direction (the transverse direction in an embodiment of the present invention) of a longer of a length of the fitting hood in a vertical direction or a length of the fitting hood in a transverse direction of the fitting hood. It is therefore possible to restrict a relative rotational movement between the female connector and the male connector.

BRIEF DESCRIPTION OF DRAWINGS

FIGS. **1**A to **3**C are plan views illustrating a related connector.

FIG. **2** is a perspective view illustrating a female connector and a male connector according to an embodiment of the present invention.

FIG. **3** is a perspective view illustrating a connector according to the embodiment of the present invention.

FIGS. **4**A and **4**B are plan views illustrating the inside of the connector according to the embodiment of the present invention.

FIGS. **5**A and **5**B are cross-sectional views illustrating the female connector and the male connector according to the embodiment of the present invention.

FIG. **6** is a cross-sectional view illustrating the connector according to the embodiment of the present invention.

FIG. **7** is a cross-sectional view illustrating the female connector according to the embodiment of the present invention.

FIG. **8**A is an elevation view illustrating the connector according to the embodiment of the present invention, and FIGS. **8**B to **8**D are cross-sectional views for explaining a rotational movement of the connector.

FIG. **9**A is a plan view for explaining a configuration of regulation projections according to the embodiment of the present invention by comparison, FIG. **9**B is a plan view for explaining contact between the female and male connectors according to the embodiment of the present invention by comparison, and FIG. **9**C is a plan view for explaining the regulation projections of the connector according to the embodiment of the present invention.

DETAILED DESCRIPTION

A connector **1** according to an embodiment of the present invention will be described below with reference to the accompanying drawings. First, the connector **1** according to the embodiment of the present invention will be described with reference to FIGS. **2** and **3**. FIG. **2** is a perspective view illustrating a female connector **12** and a male connector **14** according to the embodiment of the present invention. FIG. **3** is a perspective view illustrating the connector **1** according to the embodiment of the present invention.

The connector **1** according to the embodiment of the present invention is a connector for electrically connecting female terminals **11** and male terminals of electric wire terminals (terminals used for a vehicle or for wiring of electrical equipment and the like installed on a vehicle).

As illustrated in FIGS. **2** and **3**, the connector **1** includes the female connector **12** which accommodates the female terminals **11** therein, and the male connector **14** which is fitted with the female connector **12** for connecting the male terminals (not illustrated) with the female terminals **11**.

The female connector **12** includes a female connector housing **21** which is cylindrically formed of synthetic resin material and the like, a connector main body **22** which accommodates the female terminals **11** therein, and an outer hood **23** which covers the connector main body **22**.

The connector main body **22** includes terminal receivers **24** with the cylindrical inside in which the female terminals **11** are accommodated; and a waterproof plug receiver **26** accommodating a waterproof plug **25** (a packing; see FIG. **3**) which is flexurally deformed to the inward side of the connector main body **22** when the male connector **14** is being fitted with the female connector **12**.

The waterproof plug **25** is formed approximately in a ring shape with a through hole in the middle. When the male connector **14** and the female connector **12** are fitted together with the waterproof plug **25** accommodated in the waterproof plug receiver **26**, the waterproof plug **25** is elastically expanded to come in close contact with the inside walls of the male connector **14** and the female connector **12**. This prevents ingress of water into the connector **1** from the side of the male connector **14**.

As to be described below with reference to FIGS. **5**A and **5**B, the outer hood **23** has paired guide grooves **27** either at opposed positions on the inside wall thereof.

The guide grooves **27** have guide ribs **43** provided on the outer periphery of the male connector **14** below inserted thereinto to hold the female connector **12** and the male connector **14** in a regular fitting position, restricting a relative rotational movement between the female connector **12** and the male connector **14**.

As to be described below with reference to FIGS. **5**A and **5**B, the paired guide grooves **27** have regulation projections **29** either on the bottom surfaces thereof. These regulation projections **29** come in contact with the guide ribs **43** of the male connector **14** below to regulate a relative vertical and transverse movement of the female connector **12** and the male connector **14** to a fitting direction in which the female connector **12** and the male connector **14** are moved for fitting together.

Specifically, if the regulation projections **29** are not provided on the paired guide grooves **27**, there is a certain amount of clearance (clearance gap) between the female connector **12** and the male connector **14**.

According to the embodiment of the present invention, the connector **1** is provided with the regulation projections **29** which come in contact with the guide ribs **43** to permit the female connector **12** to be deformed within a range of the transverse direction of the female connector **12** in the direction indicated by the arrows S in FIG. **4**A bellow.

This deformation in the transverse direction permits the female connector **12** to be deformed within a range of the vertical direction of the female connector **12** in the direction indicated by the arrows T in FIG. **4**A bellow, reducing an amount of clearance (clearance gap) between the female connector **12** and the male connector **14**.

For the transverse direction of the female connector **12**, the regulation projections **29** in contact with the guide ribs **43** restrict the relative rotational movement between the female connector **12** and the male connector **14**. For the vertical direction of the female connector **12**, the regulation projections **29** in contact with the guide ribs **43** reduce the amount of clearance (clearance gap) between the female connector **12** and the male connector **14**, restricting the relative rotational movement between the female connector **12** and the male connector **14**.

Such being the case, the guide ribs **43** inserted into the guide grooves **27** enable to restrict the relative rotational movement between the female connector **12** and the male connector **14**.

The guide grooves **27** have on the bottom surface the regulation projections **29** which come in contact with the guide ribs **43** to regulate the relative vertical and transverse movement between the female connector **12** and the male connector **14**. It is therefore possible to inhibit an increase in a fitting force with which the female connector **12** and the male connector **14** are fitted together.

Accordingly, it is possible to provide the connector **1** which is capable of restricting the relative rotational movement between the female connector **12** and the male connector **14** and inhibiting an increase in the fitting force of the female connector **12** and the male connector **14**.

The female connector **12** includes a front holder **30** which comes in contact with the inside wall of the waterproof plug **25** (inside the ring) to be fitted with male tabs **44** of the male connector **14** bellow.

The male connector **14** includes a male connector housing **41** which is formed in a cylindrical shape of synthetic resin material and the like, and a fitting hood **42** which is inserted in between the connector main body **22** and the outer hood **23** when the female connector **12** and the male connector **14** are fitted together.

The fitting hood **42** is formed in a cylindrical shape with a transversely elongated cross-section. The fitting hood **42** includes the guide ribs **43** which are either integrally formed on the both side walls of the fitting hood **42** and extend in the front-back direction (in the fitting direction of the female connector **12** and the male connector **14**). The male connector **14** also includes the male tabs **44** (see FIG. **3**) which are fitted with the front holder **30** of the female connector **12**.

The guide ribs **43** which are either integrally formed on the both side walls of the fitting hood **42** are accommodated in the guide grooves **27** provided in the female connector **12** when the female connector **12** and the male connector **14** are fitted together.

The guide ribs **43** are formed on the both side walls of the fitting hood **42** located in a direction (the transverse direction for the embodiment of the present invention) of a longer one of the length of the fitting hood **42** in the vertical direction or the length of the fitting hood **42** in the transverse direction. In other words, the guide ribs **43** are formed on the transverse side walls of the fitting hood **42** in the embodiment of the present invention.

Such being the case, the guide ribs **43** formed on the both side walls of the fitting hood **42** enable the female connector **12** and the male connector **14** to be held in the regular fitting position. The guide ribs **43** inserted into the guide grooves **27** (see FIG. **5**A bellow) enable to increase a holding force.

The guide ribs **43** formed on the both side walls of the fitting hood **42** located in a direction (the transverse direction for the embodiment of the present invention) of a longer one of the length of the fitting hood **42** in the vertical direction or the length of the fitting hood **42** in the vertical direction enable to restrict the relative rotational movement between the female connector **12** and the male connector **14**.

As illustrated in FIG. **3**, the female terminals **11** include connections **71** connected with ends (not illustrated) of the male terminals, terminal waterproof plugs (packing) **72** which come in close contact with the terminal receivers **24** of the female connector **12**, and electric wires **73** connected to a vehicle or electrical equipment and the like installed on a vehicle.

The terminal waterproof plugs **72** are elastically expanded to come in close contact with inside walls of the terminal receivers **24** of the female connector **12**. This prevents ingress of water into the connector **1** via the terminal receivers **24**.

Next, fitting of the female connector **12** and the male connector **14** will be described with reference to FIGS. **4**A to **6**.

FIG. **4**A is a plan view illustrating the inside of the female connector **12** according to the embodiment of the present invention. FIG. **4**B is a plan view illustrating the inside of the male connector **14** according to the embodiment of the present invention. FIG. **5**A is a cross-sectional view illustrating the female connector **12** according to the embodiment of the present invention. FIG. **5**B is a cross-sectional view illustrating the male connector **14** according to the embodiment of the present invention. FIG. **6** is a cross-sectional view illustrating the connector **1** according to the embodiment of the present invention.

As illustrated in FIGS. **4**A to **6**, when the female connector housing **21** and the male connector housing **41** are fitted together, the fitting hood **42** is inserted into between the connector main body **22** and the outer hood **23**. When fitting, the guide ribs **43** slide on the guide grooves **27** to guide the male connector **14** to the regular fitting position.

In this state, the female terminals **11** are accommodated in the terminal receivers **24** of the connector main body **22**. When the female connector housing **21** and the male connector housing **41** are fitted together, the connections **71** of the female terminals **11** are connected with connections (not illustrated) of the male terminal and the waterproof plug **25** is accommodated in the waterproof plug receiver **26** of the connector main body **22** (see FIG. **3**).

The male tabs **44** provided inside the male connector housing **41** are fitted with one side of the front holder **30** (a side opposed to the waterproof plug **25**) approximately at the center in the fitting direction of the female connector **12** and the male connector **14** (see FIG. **3**).

And then, a lock arm **31** provided in the female connector housing **21** runs on the upper portion of a lock projection **45** provided in the male connector housing **41** to be flexurally deformed in the upper direction.

When the female connector **12** and the male connector **14** are fitted together to the regular fitting position, the lock projection **45** is inserted inside a lock hole **32** (see FIG. **4**A) and the lock arm **31** goes back to the original shape from the flexural deformation.

Such being the case, an end portion of the lock projection **45** on the side of the male connector **14** is in contact with and engaged with a portion of the lock arm **31** on the side of the female terminals **11**. It is therefore possible to hold the female connector **12** and the male connector **14** such that the female connector **12** and the male connector **14** cannot be detached from each other from a fitting state where the female connector **12** and the male connector **14** are fitted together.

As illustrated in FIG. **5**A, the female connector **12** according to the embodiment of the present invention has the regulation projections **29** provided at the rear positions of guide surfaces **28** of the first and second guide grooves **27** provided on the inside wall of the outer hood **23**.

The regulation projections **29** are provided at positions adjacent to the terminal receivers **24** where regulation projections **29** can reduce a friction between the female terminals **11** and the male tabs **44** generated by a rotation of the connector **1**.

Such being the case, the regulation projections **29** are provided at the rear positions of the guide surfaces **28** of the paired guide grooves **27** provided on the inside wall of the outer hood **23**. It is therefore possible to restrict the relative rotational movement between the female connector **12** and the male connector **14** and reduce a friction between the female terminals **11** and the male tabs **44** generated by a rotational movement of the connector **1** when the female connector **12** and the male connector **14** are fitted together.

The female connector **12** and the male connector **14** can have a proper amount of clearance (clearance gap) therebetween when the female connector **12** and the male connector **14** are fitted together. It is therefore possible to inhibit an increase in the fitting force of the connector **1**.

Next, the regulation projections **29** provided in the female connector **12** according to the embodiment of the present invention will be described in detail with reference to FIGS. **7** to **9**C.

FIG. **7** is a cross-sectional view illustrating the female connector **12** according to the embodiment of the present invention. FIG. **8**A is an elevation view illustrating the male connector **14** according to the embodiment of the present invention. FIG. **8**B is a cross-sectional view for explaining a movement in the transverse direction of the female connector **12** according to the embodiment of the present invention. FIG. **8**C is a cross-sectional view for explaining a movement in the vertical direction of the female connector **12** according to the embodiment of the present invention. FIG. **8**D is a cross-sectional view for explaining a movement in a front-back direction of the female connector **12** according to the embodiment of the present invention.

FIG. **9**A is a comparison plan view for explaining a configuration of the regulation projections **29** according to the embodiment of the present invention. FIG. **9**B is a comparison view for explaining contact between the female connector **12** and the male connector **14** according to the embodiment of the present invention. FIG. **9**C is a view for explaining the regulation projections **29** of the connector according to the embodiment of the present invention.

As illustrated in FIG. **7**, the female connector **12** is provided with the paired guide grooves **27** each having the guide surface **28** and the regulation projection **29** within the width A set to the outer hood **23** on the side of the terminal receivers **24**. The regulation projections **29** are either provided at the rear positions of the guide surfaces **28** of the paired guide grooves **27**.

As illustrated in FIG. **8**A, the guide ribs **43** are either formed on the both side walls (the both side walls located in the transverse direction in FIG. **8**A) of the fitting hood **42** located in a direction of a longer one of the length X of the fitting hood **42** in the vertical direction or the length Y of the fitting hood **42** in the transverse direction.

When the female connector **12** is moved in the transverse direction B (in the direction horizontal to the fitting direction of the female connector **12** and the male connector **14**) as illustrated in FIG. **8**B and the female connector **12** is moved in the vertical direction C (in the direction perpendicular to the fitting direction of the female connector **12** and the male connector **14**) as illustrated in FIG. **8**C, the contact points E of the female terminals **11** and the male tabs **44** are moved in the transverse direction and for the front-back direction.

When the female connector **12** is moved in the front-back direction D (in the fitting direction of the female connector **12** and the male connector **14**) as illustrated in FIG. **8**D, the contact points E of the female terminals **11** and the male tabs **44** are moved in the front-back direction.

If the distance between the center line O of the female connector **12** and the male connector **14** illustrated in FIGS. **8**B to **8**D and the contact points E of the female terminals **11** and the male tabs **44** is larger, the movement distance F of the contact points E of the female terminals **11** and the male tabs **44** (see FIG. **8**C) is also larger and abrasion at the contact points E is promoted by the movement (rotational movement) of the connector **1**, decreasing the vibration proof of the connector **1**.

According to the embodiment of the present invention, the connector **1** has the regulation projections **29** provided at the rear positions of the guide surfaces **28** of the paired guide grooves **27** of the female connector **12** (the side of the terminal receivers **24**) and adjacent to a position where the movement distance F (see FIG. **8**C) is large.

If the outer hood **23** does not have the regulation projections **29** as illustrated in FIG. **9**A, there is not a proper amount of clearance (clearance gap) between the fitting hood **42** and the regulation projections **29**, causing a problem of an increase in the fitting force.

Particularly the fitting hood **42** of the male connector **14** is formed in a thin cylindrical shape of synthetic resin material and the like. This causes warpage at the time of formation of resin and the warpage interferes with the female connector **12** when the male connector **14** is fitted with the female connector **12**, increasing a fitting resistance between the male connector **14** and the female connector **12**.

In contrast, if the regulation projections **29** are provided at four locations in the direction perpendicular to the fitting direction of the female connector **12** and the male connector **14** as illustrated in FIG. **9**B, the male connector **14** is elastically expanded when the male connector **14** is fitted with the female connector **12**. For this reason, the male connector **14** comes in contact with the female connector **12** also at portions other than the regulation projections **29**.

If the regulation projections **29** are provided at two locations in the direction perpendicular to the fitting direction of the female connector **12** and the male connector **14** as illustrated in FIG. **9**C, both an amount of clearance (clearance gap) at the portions other than the regulation projections **29** and the fitting force are decreased.

For this reason, according to the embodiment of the present invention, the connector **1** has the paired guide grooves **27** provided on the inside wall of the outer hood **23** of the female connector **12** and the regulation projections **29** provided at the rear positions of the guide surfaces **28** of the paired guide grooves **27** (see FIGS. **5**A and **7**) in order to restrict the rotational movement of the connector **1** in the direction in which the movement distance F of the contact points E of the female terminals **11** and the male tabs **44** is increased.

Such being the case, the regulation projections **29** are provided at the rear positions of the guide surfaces **28** of the paired guide grooves **27**. It is therefore possible to reduce the friction at each of the contact points E generated by the movement (rotational movement) of the connector **1** and restrict the rotational movement of the connector **1**, inhibiting an increase in the fitting force.

According to the embodiment of the present invention, the connector **1** has the female connector **12** which accommodates the female terminals **11** of an electric wire terminal and has the hood (the outer hood) **23**, and the male connector **12** which accommodates the male terminals of an electric wire

terminal and is fitted in the hood **23** of the female connector **12** for connection of the female terminals **11** and the male terminals. The connector **1** includes the paired guide grooves **27** either provided at the opposed positions on the inside wall of the hood **23** of the female connector **12**, the paired guide ribs **43** provided on the outer periphery of the male connector **14** and either inserted into the paired guide grooves **27** with the female connector **12** and the male connector **14** being fitted together to regulate the relative rotational movement between the female connector **12** and the male connector **14**, and the regulation projections **29** either provided on the bottom surfaces of the paired guide grooves **27** and either in contact with the paired guide ribs **43** to regulate the relative vertical and transverse movement between the female connector **12** and the male connector **14**.

According to the embodiment of the present invention, the connector **1** has the female connector **12** including the female connector housing **21**, the connector main body **22** having the terminal receivers **24**, and the outer hood **23** covering the connector main body **22**. The paired guide grooves **27** are provided on the inside wall of the outer hood **23**. The regulation projections **29** are either provided at the rear positions of the guide surfaces of the paired guide grooves **27**.

According to the embodiment of the present invention, the connector **1** has the male connector **14** including the male connector housing **41** and the fitting hood **42** inserted into between the connector main body **22** and the outer hood **23** when the female connector **12** and the male connector together **14** are fitted together. The guide ribs **43** are formed on the both side walls of the fitting hood **42** located in a direction of a longer one of the length of the fitting hood **42** in the vertical direction or the length of the fitting hood **42** in the transverse direction.

According to the embodiment of the present invention, the connector **1** has the guide ribs **43** inserted into the guide grooves **27**. It is therefore possible to restrict the relative rotational movement between the female connector **12** and the male connector **14**.

The guide grooves **27** have at the bottom surfaces the regulation projections **29** which come in contact with the guide ribs **43** to restrict the relative vertical and transverse movement between the female connector **12** and the male connector **14**. It is therefore possible to inhibit an increase in the fitting force.

It is therefore possible to provide the connector **1** capable of restricting the relative rotational movement between the female connector **12** and the male connector **14** and inhibit an increase in the fitting force of the female connector **12** and the male connector **14**.

According to the embodiment of the present invention, the connector **1** has the regulation projections **29** provided at the rear positions of the guide surfaces **28** of the paired guide grooves **27** provided on the inside wall of the outer hood **23**. It is therefore possible to restrict the relative rotational movement between the female connector **12** and the male connector **14** and reduce the friction between the female terminals **11** and the male tabs **44** generated by a rotational movement of the connector **1** when the female connector **12** and the male connector together **14** are fitted together.

The female connector **12** and the male connector **14** have a proper amount of clearance (clearance gap) therebetween when the female connector **12** and the male connector **14** are fitted together. It is therefore possible to inhibit an increase in the fitting force of the connector **1**.

According to the embodiment of the present invention, the connector **1** has the paired guide ribs **43** formed on the both side walls of the fitting hood **42**. It is therefore possible to hold the female connector **12** and the male connector **14** in the regular fitting position. The connector **1** also has the guide ribs **43** inserted into the guide grooves **27**. It is therefore possible to increase the holding force.

The guide ribs **43** are formed on the both side walls of the fitting hood **42** located in a direction (the transverse direction for the embodiment of the present invention) of a longer one of the length of the fitting hood **42** in the vertical direction or the length of the fitting hood **42** in the transverse direction. It is therefore possible to restrict the relative rotational movement between the female connector **12** and the male connector **14**.

According to the embodiment of the present invention, the connector **1** has the regulation projections **29** provided at the rear positions of the guide surfaces **28** of the paired guide grooves **27**. It is therefore possible to reduce the friction at each of the contact points E (see FIG. **8**C) generated by the rotational movement of the connector **1** and restrict the rotational movement of the connector **1**, inhibiting an increase in the fitting force.

The connector **1** has been described above based on the illustrated embodiment. However, it is to be understood that the present invention will not be limited only to the embodiment and that the configurations of the respective constituents may be replaced by any other arbitrary configurations having similar functions.

In the embodiment of the present invention above, for example, the guide ribs **43** are formed to be located in the transverse direction of the fitting hood **42**. However, the guide ribs **43** may be formed to be located in the vertical direction of the fitting hood **42** when, among the lengths in the vertical direction and the transverse direction of the fitting hood **42**, the length in the vertical direction is greater than the length in the transverse direction.

What is claimed is:

1. A connector comprising:

a female connector configured to accommodate a female terminal of an electric wire terminal and having a hood; and

a male connector configured to accommodate a male terminal of an electric wire terminal and be fitted in the hood for connection of the female terminal and the male terminal, wherein

the female connector includes

first and second guide grooves respectively provided on an inside wall of the hood in opposed positions in a transverse direction,

a first regulation projection provided on a first bottom surface of the first guide groove, and

a second regulation projection provided on a second bottom surface of the second guide groove;

the first bottom surface and the second bottom surface face each other in the transverse direction;

the male connector includes first and second guide ribs provided on an outer periphery of the male connector;

the first and second guide ribs are positioned in the first and second guide grooves with the female connector and the male connector being fitted together, wherein the first and second guide ribs are configured to regulate a relative rotational movement between the female connector and the male connector;

the first and second regulation projections respectively being in contact with the first and second side surfaces of the first and second guide ribs in the transverse direction are configured to regulate a relative vertical and transverse movement between the female connector and the male connector, the regulation projections provided

only at a distal end of the first and second guide grooves adjacent to the female terminal housed within the female connector; and

the female connector is configured to be extended in the transverse direction and shrunk in a vertical direction by the first and second regulation projections and the first and second guide ribs being in contact with each other.

2. The connector according to claim **1**, wherein:

the female connector includes

a female connector housing for connecting with the male connector,

a connector main body having a terminal receiver, the connector main body in contact with and surrounded by the female connector housing, and

the hood covering the connector main body;

the first and second guide grooves are provided on an inside wall of the hood; and

the regulation projections are provided at rear positions of guide surfaces of the first and second guide grooves.

3. The connector according to claim **2**, wherein:

the male connector includes

a male connector housing, and

a fitting hood formed at one end of the male connector housing and inserted into between the connector main body and the hood when the female connector and the male connector are fitted together, and

the first and second guide ribs are formed on side walls of the fitting hood located in a direction of a longer of a length of the fitting hood in a vertical direction or a length of the fitting hood in a transverse direction of the fitting hood.

4. The connector according to claim **1**,

wherein the bottom surfaces of the first and second guide grooves face each other in the transverse direction, and

wherein the regulation projections are configured to be in contact with side surfaces of the first and second guide ribs in the transverse direction.

5. The connector according to claim **2**,

wherein the bottom surfaces of the first and second guide grooves face each other in the transverse direction, and

wherein the regulation projections are configured to be in contact with side surfaces of the first and second guide ribs in the transverse direction.

6. The connector according to claim **3**,

wherein the bottom surfaces of the first and second guide grooves face each other in the transverse direction, and

wherein the regulation projections are configured to be in contact with side surfaces of the first and second guide ribs in the transverse direction.

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